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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/681,220	02/27/2001	Venkat Subramaniam Venkataramani	RD-27679	7006
6147	7590	06/04/2004	EXAMINER	
GENERAL ELECTRIC COMPANY GLOBAL RESEARCH PATENT DOCKET RM. BLDG. K1-4A59 SCHENECTADY, NY 12301-0008			JAWORSKI, FRANCIS J	
			ART UNIT	PAPER NUMBER
			3737	10

DATE MAILED: 06/04/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/681,220

Applicant(s)

VENKATARAMANI ET AL.

Examiner

Jaworski Francis J.

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 October 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 22-24 is/are allowed.
- 6) ☒ Claim(s) 1-21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 4 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

A broad range or limitation together with a narrow range or limitation that falls within the broad range or limitation (in the same claim) is considered indefinite, since the resulting claim does not clearly set forth the metes and bounds of the patent protection desired. Note the explanation given by the Board of Patent Appeals and Interferences in *Ex parte Wu*, 10 USPQ2d 2031, 2033 (Bd. Pat. App. & Inter. 1989), as to where broad language is followed by "such as" and then narrow language. The Board stated that this can render a claim indefinite by raising a question or doubt as to whether the feature introduced by such language is (a) merely exemplary of the remainder of the claim, and therefore not required, or (b) a required feature of the claims. Note also, for example, the decisions of *Ex parte Steigewald*, 131 USPQ 74 (Bd. App. 1961); *Ex parte Hall*, 83 USPQ 38 (Bd. App. 1948); and *Ex parte Hasche*, 86 USPQ 481 (Bd. App. 1949). In the present instance, claim 4 recites the broad recitation 'less than about 100um', and the claim also recites '(most preferably) less than 10 um' which is the narrower statement of the range/limitation.

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Statements of preferences when placed within the claims as opposed to the specification lead to confusion in scope. See MPEP Section 2173.05(c) item I.

(Parenthesized claim numbers following a rejection statement denote the specific claim or claims against which the immediately preceding argument is directed.)

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-3, 5, 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takeuchi (US4881212).

[The Takeuchi patent contains its correct drawings as an addendum to its certificate of correction..] Takeuchi teaches a matching layer in its true face figure which is comprised of a plurality of laminate layers transitioning between transducer 3 and target subject 4 . When the target subject is the living body in the case of medical usage, the impedance values diminish in order to 'match' the higher acoustic impedance transducer to the lower acoustic impedance of the body and in a fashion akin to conventional quarter wavelength matching (col. 1), a process described in cols. 2-3 bridging. Since the layers transition between these values the matching layer

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nearest the transducer is necessarily somewhat less than in acoustic impedance than that material and the layer nearest the medical subject is necessarily somewhat greater than the impedance of the body (Claims 1,5).

Since the ideal transition is a smooth continuum of impedance change for which the multi-layer Takeuchi laminate is an approximation, it would have been inherently obvious that the most preferable case would have been to provide a great many layers with the layers proximate the transducer and target having near to or equal to the acoustic impedance of same. (Claims 2-3).

Each sublayer in Takeuchi is a combination of a uniform layer set of heavy metal with intermediate layer of uniform plastic. (Claim 8).

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Takeuchi (US4881212) in view of Eberle et al (US5779644).

Takeuchi specifies the relative thicknesses of the laminates in terms of fractional wavelength, see col. 2 lines 18-23 since wavelength per se would be application-specific between medical versus industrial embodiments. Therefore Takeuchi does not provide specific micrometer dimensions. However Eberle et al evidences that quarter-wavelength matching layers were used in medical application on catheters where relatively high frequencies such as 20Mhz which are ordinarily too attenuative to perform deep scanning are used to investigate proximal artery walls, whereupon the matching layers occupy for example a .06mm or 60 um approximate quarter wavelength thickness relative to a 100micron transducer thickness. See col. 9 line 53 – col. 10 line 1,4 and col. 10 lines 40-49. Additionally, since Takeuchi is advocating a laminated

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approximation to a quarter wavelength matching layer with each sublayer a fractional thickness to the whole, i.e. $\lambda/10$ - $\lambda/20$ where $\lambda/4$ is the whole, applicants' 'most preferable range' or 10 micrometer thickness would reasonably be met when Takeuchi is modified for such a medical catheter implementation as taught by Eberle et al.

Claims 6-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takeuchi as applied to claim 1 above, and further in view of Goll (US4016530). Takeuchi does not extend its teaching to layering arrangements which are odd multiples of the quarter-wavelength unit. However Goll evidences that it was well-known early in the art that odd multiples of a quarter wavelength could be used to achieve impedance transition (as well as to half-wavelength double-transit time echo cancellation that quarter wavelengths provide.), see col. 3 lines 1 – 24 as exemplary, and therefore it would have been a matter of design to incorporate same into Takeuchi, particularly since Takeuchi implicitly allows that the multi-layer laminates might exceed a quarter wavelength total thickness. (Claim 6).

One would not want to provide an overly thickened transition such as greater than $2\frac{1}{4}\lambda$ because at some point the attenuation in the transition would cause signal loss. (Claim 7).

Claims 9-15, 20-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takeuchi as applied to claim 1 above, and further in view of Sano et al (US5974884). Takeuchi does not teach forming an impedance matching sublayer out of different impedance value materials such that each forms a pattern within the

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sublayer. However it would have been obvious in view of Sano et al Fig. 1 elements 8 and 9 to so composite a pattern to form a smoothly transitioning impedance element (Claim 9).

Insofar as claim 10 pertains to a product-by-process which has the resulting feature of the composite including openings in a sheet of material, col. 7 lines 7 – end pertains to a process of forming first sublayer sheet and then filling the openings defined by the voids between protrusions of the sheet with the second component of the composite. The basic sublayer assemblage method is taught in Takeuchi. (Claims 10, 15).

Col. 6 line 65 – col. 7 line 6 pertain to the materials recited for the first and second components of the composite. (Claims 11 – 12, 20-21).

The epoxy resin which is mixed with tungsten in Sano et al for example serves as a binder for the mixture. (Claims 13 – 14).

Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al (US5792058). Lee et al teaches forming a subassembly including ultrasound transducer array and plural matching layers on a temporary front carrier plate substrate which is later removed., see col. 2 lines 25-41. Although Lee et al col. 6 lines 18-40 falls short of describing the plural matching layers as having a monotonically changing impedance, it would have been inherently obvious to have done so since the layers must serve to transition from a high to a lower acoustic impedance value. (Claim 17).

Claims 18 – 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al as applied to claim 17 above, and further in view of Takeuchi. Whereas Lee et

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al is silent as to sublayer component use of metallic layers, they do note that metallic layers may be electroplated, see cols. 7-8 bridging, whereupon it would have been obvious in view of Takeuchi to use such metallized sublayers within an impedance-transitioning multi-layer laminate, see col. 1 lines 49-60 thereof.


Allowable Subject Matter

Claims 22 – 24 are allowed.

Any inquiry concerning this communication should be directed to Jaworski Francis J. at telephone number 703-308-3061.

FJJ:fjj

5-28-04


Francis C. Jaworski
Primary Examiner